REMARKS

This application has been carefully reviewed in light of the Office Action dated May 28, 2003. Claims 1 to 12 are now pending in the application, with Claims 11 and 12 having been added. Claims 1, 2, 7, 11 and 12 are the independent claims herein. Reconsideration and further examination are respectfully requested.

Claims 1 to 10 were rejected under 35 U.S.C. § 102(a) over U.S. Patent No. 5,795,082 (Shimada). The rejections are respectfully traversed and the Examiner is requested to reconsider and withdrawal the rejections in light of the following comments.

The present invention concerns quantization of input image data to multi-value data with three or more levels. Conventionally, devices perform quantization in two levels: no dot (i.e., not printing a dot on a particular pixel), or dot-on (i.e., printing a dot on a particular pixel). For devices that print with both low density and high density ink, quantization for low density data is performed in the two levels (no dot; dot-on), and quantization for the high density data is likewise performed in the two levels (no dot; dot-on). Thus, for such conventional devices, since quantization is only performed on two levels, only three kinds of recording dots can be printed: 1) no dot, 2) dot-on for low density, and 3) dot-on for high density.

In contrast, the present invention performs quantization in three or more levels for each type of data. The three levels may be, for example: 1) no dot, 2) dot-on level 1, and 3) dot-on level 2. Thus, for devices that print with both low density and high density ink, quantization for the low density data is performed in the three levels (no dot; dot-on level 1; dot-on level 2), and quantization for the high density data is likewise performed in the three levels (no dot; dot-on level 1; dot-on level 2). Thus, as seen in

Figure 7 of the subject application, five different kinds of recording dots can be printed: 1) no dot, 2) dot-on level 1 for low density, 3) dot-on level 2 for low density, 4) dot-on level 1 for high density, and 5) dot-on level 2 for high density. The foregoing process provides for a higher quality image than the conventional (two level quantization) process.

Referring specifically to the claims, independent Claim 1 is a quantization method in which quantization processing is applied to data for first and second recording means which record input image data in a plurality of gradations which belong to each of different gradations in substantially the same hue, comprising the steps of inputting multi-value level image data, a first quantization step of performing quantization of the image data input for the first recording means to data with a lower level than that of the input image data, the first quantization step performing the quantization by conducting error correction, and a second quantization step of performing quantization of the image data input for the second recording means to data with a lower level than that of the input image data, the second quantization step performing the quantization without conducting error correction, wherein at least one of the first and second quantization steps performs quantization of the input image data to multi-value data with 3 or more levels, so that the corresponding one of the first and second recording means may record the image in a plurality of gradations, wherein the first recording means records the image with lower density recording material than that used by the second recording means.

Independent Claims 2 and 7 are apparatus and recording-medium claims, respectively, that substantially correspond to Claim 1.

The applied art is not seen to disclose or to suggest the features of Claims 1, 2 and 7, and in particular, is not seen to disclose or to suggest at least the feature of first

and second quantization steps performing quantization of input image data to multi-value data with 3 or more levels, so that corresponding ones of first and second recording means may record the image in a plurality of gradations, wherein the first recording means records the image with lower density recording material than that used by the second recording means.

Shimada is merely seen to disclose performing quantization of low density data (S140 of Fig. 12) with two levels (on/off state, (i.e., no dot or dot-on)) and quantization of high density data (S120 of Fig. 12) with two levels (on/off state (i.e., no dot or dot-on)). Thus, Shimada merely corresponds to the above-described conventional process and does not quantize the low density data with 3 or more levels, or quantize the high density data with 3 or more levels. Accordingly, Shimada is not seen to disclose or to suggest the features of Claims 1, 2 and 7. As such, Claims 1 to 10 are believed to be allowable.

Referring now to newly-added Claims 11 and 12, input image data is quantized to first data defining the size of dots printed by a first ink (e.g., a low density ink). The input image data is quantized to second data defining the size of dots to be printed by a second ink (e.g., high density ink). Then, a print head is caused to print, by the first ink, a first dot having the size corresponding to the first data and to overlay, by the second ink, a second dot having the size corresponding to the second data on the first dot.

With specific reference to the claims, newly-added Claim 11 is a printing system for recording a multi-tone image, comprising a print head, from which first and second inks of different densities are dischargeable, for printing dots of different sizes by using each one of the first and second inks, input means for inputting multi-valve image

data, first quantization means for quantizing the input image data to first data defining the size of dots printed by the first ink, second quantization means for quantizing the input image data to second data defining the size of dots printed by the second ink, and control means for causing the print head to print, by the first ink, a first dot having the size corresponding to the first data and to overlay, by the second ink, a second dot having the size corresponding to the second data on the first dot.

Newly-added independent Claim 12 is a method claim that substantially corresponds to Claim 11.

The art of record is not seen to disclose or to suggest the features of newly-added Claims 11 and 12, and in particular is not seen to disclose or to suggest at least the feature of quantizing input image data to first data defining the size of dots to be printed by a first ink, quantizing input image data to second data defining the size of dots to be printed by a second ink, and causing a print head to print, by the first ink, a first dot having the size corresponding to the first data and to overlay, by the second ink, a second dot having the size corresponding to the second data on the first dot.

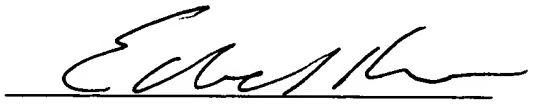
Shimada, and in particular, Figs. 18a to 18h, depict ratios for printing low density dots and high density dots, all of which are of the same size, depending on the image tone. Thus, Shimada is not seen to disclose printing dots of different sizes for different inks that overlay each other, muchless, performing the claimed quantization process. Accordingly, Shimada is not seen to disclose or to suggest at least the feature of quantizing input image data to first data defining the size of dots to be printed by a first ink, quantizing input image data to second data defining the size of dots to be printed by a second ink, and causing a print head to print, by the first ink, a first dot having the size

corresponding to the first data and to overlay, by the second ink, a second dot having the size corresponding to the second data on the first dot.

In view of the foregoing deficiencies of the applied art, all of Claims 1 to 12 are believed to be allowable. Accordingly, the entire application is believed to be in condition for allowance and such action is respectfully requested at the Examiner's earliest convenience.

Applicants' undersigned attorney may be reached in our Costa Mesa, California office at (714) 540-8700. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,



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